aurium, and it occurred to me that since a large number of persons have noises in the head—say one-half the entire adult population—it is probable that, when listening intently, a considerable number of observers heard the sounds of their own ears only. This is especially true of "sizzling," "hissing," and "buzzing" sounds.

If physicians affected with tinnitus are not careful to exclude the noises propagated in their own heads, they may discover many curious physical signs in the chests of their patients in making auscultatory examinations. SAMUEL SEXTON

12, West Thirty-fifth Street, New York, October 12

The Red Spot on Jupiter

ON October 24, at 17h. 32m., this object was estimated exactly central on the planet. As seen with my 10-inch reflector, power 252, the spot was very plain, though the low altitude of Jupiter rendered the telescopic image far from good.

My impression is that this red spot is now decidedly more conspicuous than it was when I last saw it on July 8, and that during the ensuing opposition it will again attract general observation as one of the most prominent features of Jovian detail. This well-known marking has now been watched for more than seven years, and its present aspect leads to the inference that its existence will be indefinitely prolonged. We may therefore justly regard it as a lineament of singular permanency. Though its motion and appearance (*i.e.* tint) have been subject to considerable variation, there has been little, if any change in either the shape or size of the spot. The mystery regarding its origin and real nature may perhaps ultimately be revealed on the basis of renewed and more exact observation in future years. W. F. DENNING

Bristol, October 25

A Remarkable Sunset

WHILE out for a walk this afternoon I was struck by a peculiarity in the sunset which I do not remember to have seen noticed before. The sun set about 4.43 p.m., and there was the usual "after-glow." I began to notice this first about five o'clock; there was then in the west a large bank of cumulus cloud rather low down, above this was a brilliant lemon-yellow, very bright, and this was bounded by a broad arc of a pale pink, the latter fading away into the light blue of the sky. Very soon afterwards I noticed that the pink arc, instead of being continuous, was really made up of a series of beams of bright light, which pointed to the position of the sun. I counted these, and made out five bright rays at unequal distances apart; behind this (as it seemed) there were a few yellow cirrus clouds. A sunset like this I have often noticed before, but what followed is, I think, novel. The bright rays were slowly turning round like the spokes of a huge wheel moving in a direction contrary to the hands of a watch. I noticed also that the breadth between the bright rays altered, two of them seeming to almost coalesce. In about ten minutes' time one ray turned approximately through 90°, and a new ray brighter than the other appeared on the right. The altitude of a ray when vertical was from 30° to 40°, I should say. By 5.15 the rays became very faint and soon vanished, though above the dark bank of cloud I could detect a faint crimson-lake glow.

The day had been fine on the whole, except that there had been a little rain early in the morning, and a very heavy rain shower between 12 30 and 1 o'clock. The air was extremely clear, and the wind was blowing freshly from the west, or perhaps it was a bit north of west. It was blowing slightly from right to left across the line joining me to the sun.

This phenomenon of the pink rays revolving seems to be explained by the dark spaces being due to clouds which were being hurried along by the strong west wind. I should like to know if any one living in a line W.S.W. of Cambridge noticed broken masses of cumulus clouds this afternoon *over head* between 5.0 and 5.15 p.m. Greenwich time. PAUL A. COBBOLD

Caius College, Cambridge, October 26

A Tertiary Rainbow

THE supposed tertiary rainbow about which I sent a note a month ago must have been a halo formed by ice crystals, as readers of NATURE will perhaps have inferred merely from the recorded distinctness of the colours. It did not occur to me that ice crystals would be found in a horizontal direction from here, over the hot plains of the Punjab on the evening of an August day. But I have since calculated the size of the tertiary rainbow and the order of colours in it, and the calculation leaves no doubt that the phenomenon must have been a solar halo, caused perhaps by a hailstorm over the plains.

Thaudiani, Punjab, Sept. 25 T. C. LEWIS

The Sense of Colour

IN the early English "Lay of Havelok the Dane" the following words occur:—

"Also he wolde with hem leyke
That weren for hunger *grene* and bleike."

Mr. Allan Cunningham in his interesting paper (p. 604) does not allude to this old use of the word green. Is it a solitary case? MARGARET HEATON

Belvedere, October 24

Stone Axes, Perak

A CURIOUS Malay superstition has come to my knowledge concerning these implements. They appear to be very rare out here, and those found are treasured by Malays as lucky things to have about the house. I have as yet only been able to procure two specimens. One of these I have described in a paper on the Sakaies read before the Anthropological Society in June last. This nearly resembles Fig. 55 in Dr. Evans' "ancient Stone Implements of Great Britain," and is made of a soft description of slate which can be scratched with the thumb-nail. The other is of a much harder description of slate almost like greenstone; it much resembles Fig. 76 of the same work. It is 7¾ inches long, 1⅞ inches wide at the widest end, which is sharpened, and 1½ inches wide at the other end, which is not sharpened. The faces are flatter than those figured by Dr. Evans and the sides perfectly squared. It is beautifully polished, but several depressions are left all over it, showing that it had originally been chipped out. The Malays call them Bâtu-lintarh—*i.e.* thunderstones—and account for their presence by saying that they are the missiles used by angels and demons in their continual warfare.

But the peculiarity of the superstition is this: the Malays aver that the soft implement which I have described has been made by an angel or a demon and buried in the earth to become hard and fit for use, and support their argument by saying that these objects have been found freshly made of clay and quite soft, buried in the earth, where they have lately been deposited by some angel or demon for a future time of battle. The Malays say that the bâtu-lintarh is hard to procure in this state, as it almost invariably drops to pieces. For this reason they do not value it much, and more particularly because it has never inflicted a wound. The hard polished celt which I have just described, however, they value very highly, because they say it has been used in the aërial warfare and has inflicted a wound on one or more of the combatants. They adduce this supposition from the fact of the several depressions left by the chipping out of the implement, and say that these marks were caused by its contact with the body of one of the demon combatants. This last idea is very closely connected with another Malay belief, and most probably took its rise from it. This belief is that if the blade of a kriss or spear is bent or in any way damaged, it has most certainly wounded if not killed a man or some wild animal, and is therefore proportionately of much greater value. A Malay who professes to be a good judge of a kriss will, if asked to appraise the weapon, invariably first glance along the blade to see if it is bent ever so slightly, and if it is he will most certainly add two or three dollars to its value because it has "m'nikam orang" (struck a man). I have very little doubt that if some of the fine limestone caves of this district were thoroughly examined, they would yield a rich harvest of anthropological material. A. HALL

Batu Gaja, Kiuta, Perak, September 6

Photographic Action on Ebonite

AT the back of one of the cases of lecture apparatus facing a north window in this laboratory, there happens to have been standing for six months or more an ebonite plate with a framed glass plate in front of it, the glass having a star-pattern done in little spots of tinfoil all over it. The thickness of the

frame, say an eighth of an inch, separated the two plates from each other.

On taking them out of the case the other day I noticed the pattern on the glass clearly and sharply imprinted on the ebonite; every little circle well marked. Dust had been plentifully deposited on all parts not screened by the tinfoil spots, and the striking clearness of the impression was mainly due to this local absence of dust; but even on wiping off some of the dust the pattern could still be detected, owing to some difference of surface between the exposed and the shaded portions.

It evidently is another illustration of Prof. McLeod's observation of the effect of light on ebonite, the modified surface affording an easy lodgment for dust. In case there be anything more in the matter it is proposed to replace the same or similar plates, and observe at intervals.

EDWARD E. ROBINSON
Lecture Assistant to the Professor of Physics in University College, Liverpool

THE SLIDE RULE

IT is a perpetual source of amazement to those who are familiar with this instrument that its use is not almost universal. People of every class have to make simple calculations, while those engaged in scientific work, in designing apparatus, or in invention perpetually cover sheets of paper with figures, all of which trouble and the loss of time which it involves might be saved by the intelligent use of a good slide rule, and yet, for reasons difficult to find out, the habitual use of this instrument is limited to a very small proportion of the calculating community.

Most people know that the scales are logarithmically divided—that is, that the distance between the divisions marked 1 and 10 being in imagination divided into 10,000 parts, the division marked 2 is at the 3010th of these parts, the division marked 3 is at the 4771st of these parts, and so on, 3010 being the log. of 2, 4771 the log. of 3, and so on; and further, that the spaces between these whole numbers are similarly divided into fractional parts, thus 1·1 is at the 414th of the imaginary parts and 1·01 at the 43rd of these parts, 414 and 13 being the logs. of 1·1 and 1·01. This is very generally known, but it is more generally believed that to use the rule involves so much thought and anxiety that it is far simpler to work out results in the usual way, or at any rate that the rule can only be of any real assistance when a great number of similar calculations have to be made; and further that, as the results to be obtained are not absolutely correct, that as an extreme error of 1, 1-10th, or 1-100th per cent. is possible, according to the nature of the instrument, it is not really to be trusted. These objections are easily answered. As soon as the slight difficulty of reading the rule has been overcome—a difficulty due to the fact that in ascending the scale the divisions become closer, so that if there is room for ten subdivisions between 10 and 11, there are only five between 20 and 21, and two between 40 and 41—a difficulty which once overcome never recurs—then the simpler calculations, such as multiplication, division, and simple proportion, can at all times without an effort or a thought be instantly performed, while those involving proportions in which some of the terms are squares, cubes, roots, sines, or tangents can, after a moment's reflection, be as easily completed, so that even in the case of single operations time is saved. It is true when many calculations of the same kind present themselves, especially if some of the terms in the series are identical, that the use of the rule is specially advantageous; but in any case mental labour and time are saved.

As to the probable accuracy of results obtained by the use of the rule, they are in general superior to the accuracy with which the figures which require reduction have been determined, or, if this is not the case, they are in general so nearly correct that the error is of no consequence. For instance, if the marks obtained by several examinees are to be reduced to correspond to a total of 100, the commonest rule, which gives an accuracy of 1-300th part, is sufficiently good; for the nearest whole number only, and the right order are all that are needed. It would be absurd to doubt the accuracy of the instrument because it cannot be trusted to give figures correct to one part in a thousand. Or, again, if the weight of a piece of metal has to be determined from its dimensions, a good rule trustworthy to 1 part in 1000 will in almost every case be more than good enough; for, even if the specific gravity of the material be known so truly, it is not often that the piece can be made so near the specified size that the discrepancy which may ultimately be observed will be due more to the error of the rule than to the inaccuracy of construction. In such a case it would be as absurd to discard the rule as untrustworthy as it is to use 7-figure logarithms for the calculations of an ordinary chemical analysis. There are cases, of course, where observations can be made with a degree of accuracy beyond that which is obtainable by any rule—for instance, determinations of mass, length, angles, and time can all be made with extraordinary precision. Where, then, uncertainty is not introduced by observations of another kind, where the entire precision to be obtained in any such observations may be expected in the result, as, for instance, in the determination of the refractive index of the glass of a prism, in such cases the slide rule is unsuitable, and tables of logarithms furnish the most obvious means of making the calculations. Or, again, when pounds, shillings, and pence are involved, a result correct to the nearest farthing is generally desired to make accounts come right, and so, unless the sums dealt with are moderate, the slide rule is again unsuitable. However, the calculation of interest furnishes a good example of proper and improper use of the rule in making calculations. If it is required to find what a certain sum (s) will be worth at the end of a year at so much (r) per cent., the result might be found from the proportion $100 : 100 + r :: s : x$. Here the amount x would be determined with an accuracy of say 1-1000th part, so that if 1000*l.* were involved, an error of 1*l.* might arise. This is an improper use of the rule. A greater degree of accuracy would be obtained by the proportion $100 : r :: s$: the increase of s. Here the interest is found to the same proportionate accuracy, and so in such a case the greatest possible error could only be one shilling, if the rate is 5 per cent. This example, though obvious, is given because it corresponds exactly with cases that arise in the laboratory, where the rule, if used properly, is of service, but, if improperly, is useless.

Calculations involving only the simple arithmetical rules, when extreme accuracy is required, are best performed by the help of a table of logarithms, or with an arithmometer; in fact with an arithmometer a far greater degree of accuracy can be reached than with ordinary 7-figure logarithms, and though they are also suitable for calculations in which only three or four significant figures are required, their great size and expense compare unfavourably with the portability and cheapness of the rule, and, moreover, trigonometrical and logarithmic functions cannot be found with them. These machines are shown at the Inventions Exhibition by Tate and Edmonson, and are worth examining. There is another calculating machine close to Tate's, by which the interest on any sum at any rate per cent. for any time may be found to the nearest halfpenny in an incredibly short space of time, worthy of the attention of those who have to calculate interest. But, to return to the slide-rule, it is astonishing that an instrument like Gravet's, 10 inches long only, with which all calculations, arithmetical, trigonometrical, and logarithmic, can be worked out so easily and with an accuracy of from 1-500 to 1-1000, according to the nature of the calculation, should be so little used.